



وزارة الصحة

مستشفى الأمير محمد بن عبد العزيز بالرياض
Prince Mohammed bin Abdulaziz Hospital - Riyadh

Adrenal gland diseases

*Third Year College of Medicine
Princess Norah Bint Abdulrahman University*

Dr Bushr Murad MBBS, FRCSC, ABDS

Wednesday 4th March 2015

Overview

- ❖ Anatomy & Embryology
- ❖ Normal Histopathology & Physiology
- ❖ Diseases of the Adrenal glands



Anatomy & Emryology

- ❖ Adrenal glands are paired
- ❖ Positioned superior and slightly medial to the kidneys, in the retroperitoneal space.
- ❖ Right: Roughly pyramidal, Left: Crescent-shaped
- ❖ 4g each, 3rd most highly perfused organs
- ❖ Cortex: mesoderm, Medulla: ectoderm

- ❖ Arterial supply:

- ❖ Superior adrenal a. (inferior phrenic)

- ❖ Small middle adrenal a. (juxtaceliac aorta)

- ❖ Inferior adrenal a. (renal)

- ❖ Venous drainage:

- ❖ Left adrenal v. (Left renal vein)

- ❖ Right adrenal v. (Inferior Vena cava)

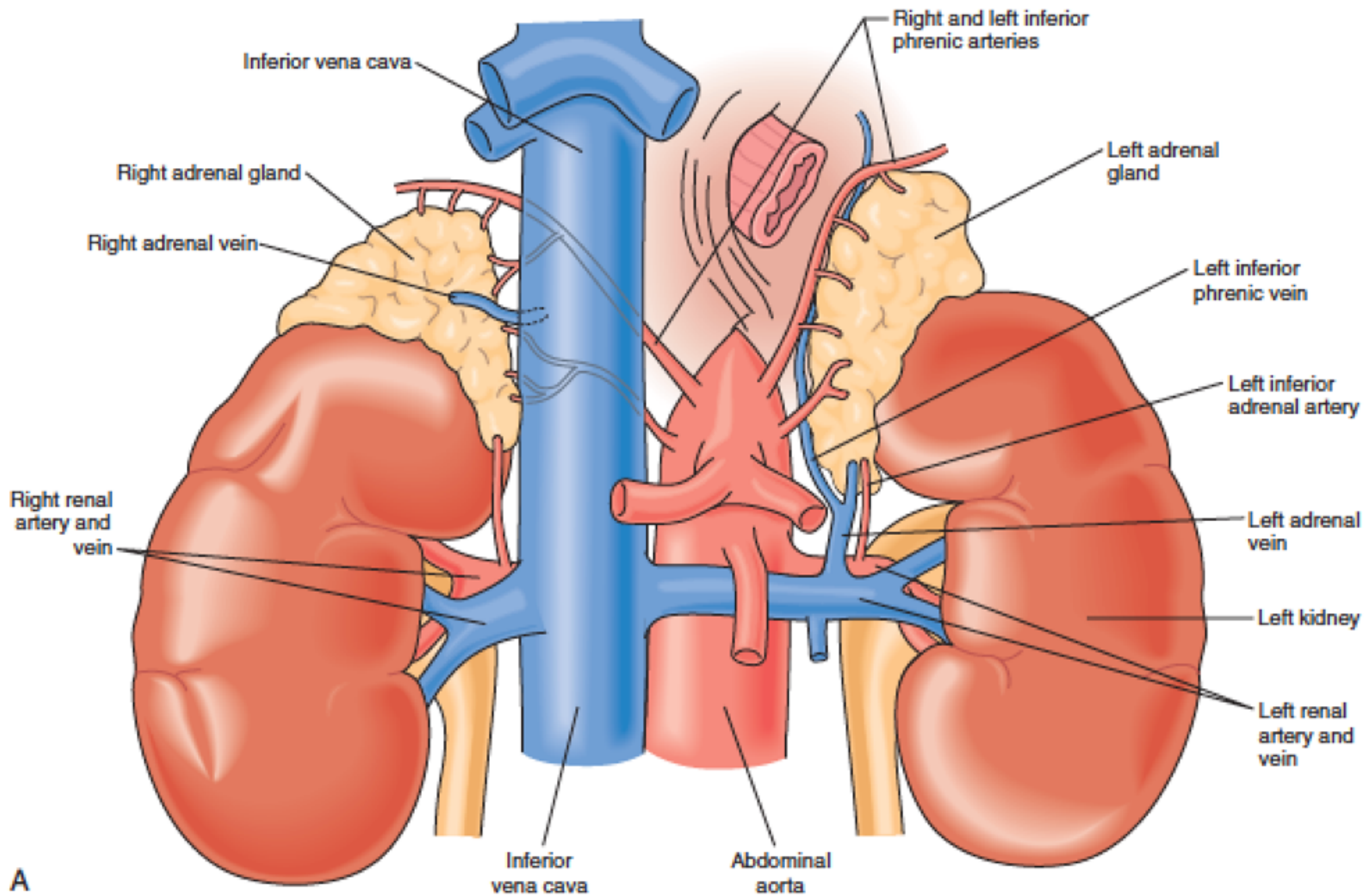
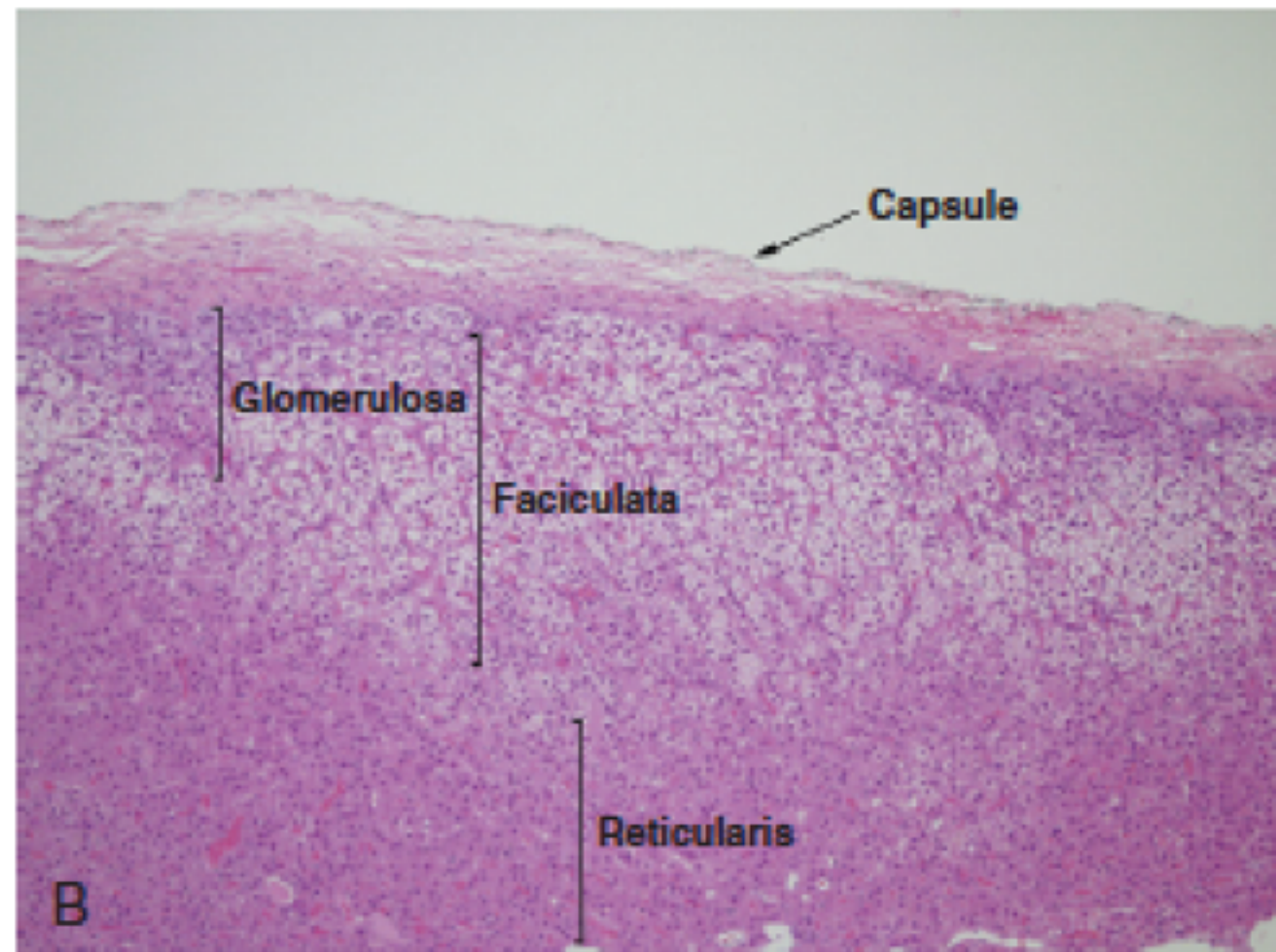
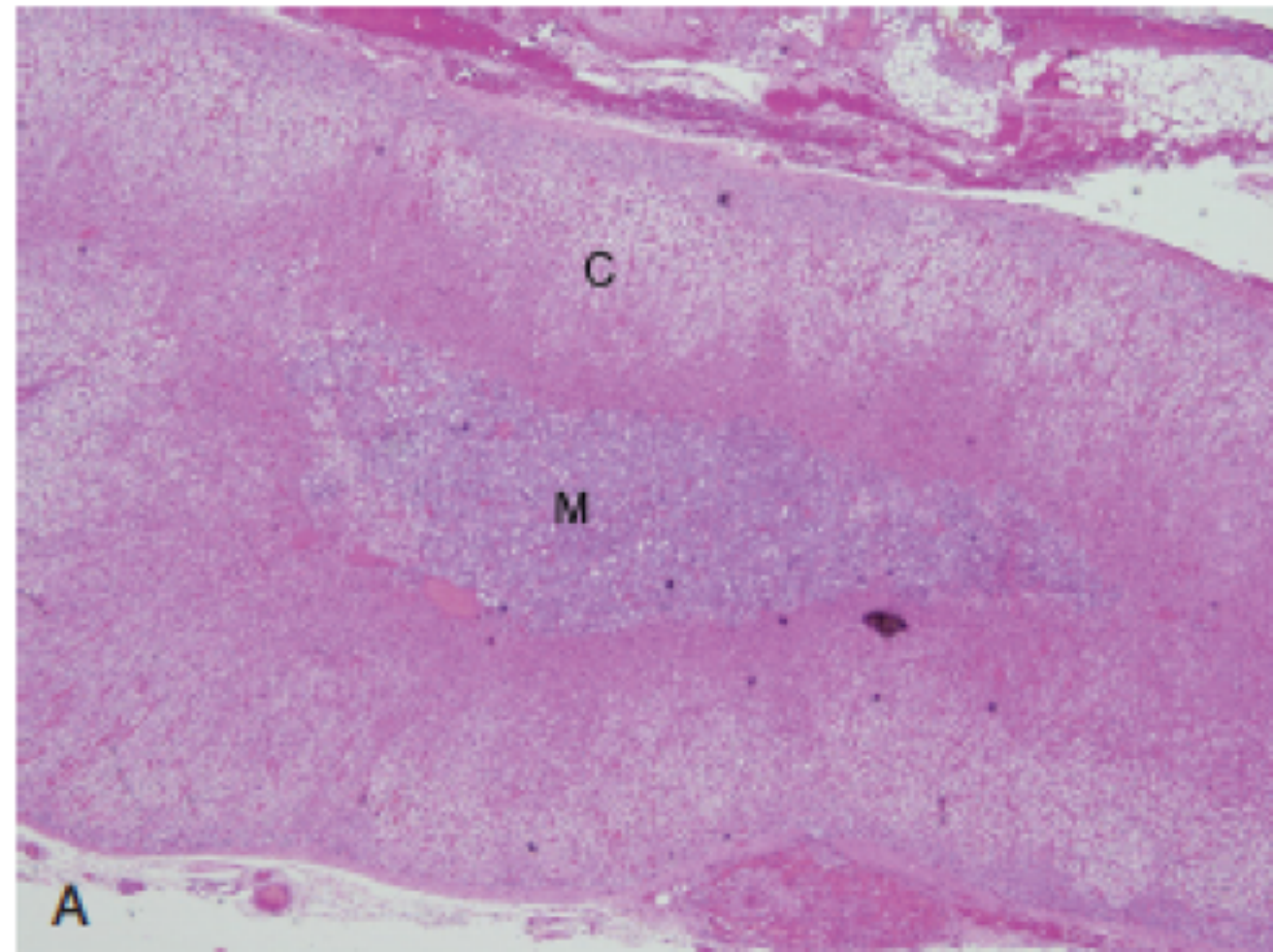


FIGURE 41-1 Anatomy of the adrenal glands. **A**, Left and right adrenal glands in situ.

Histopathology & Physiology

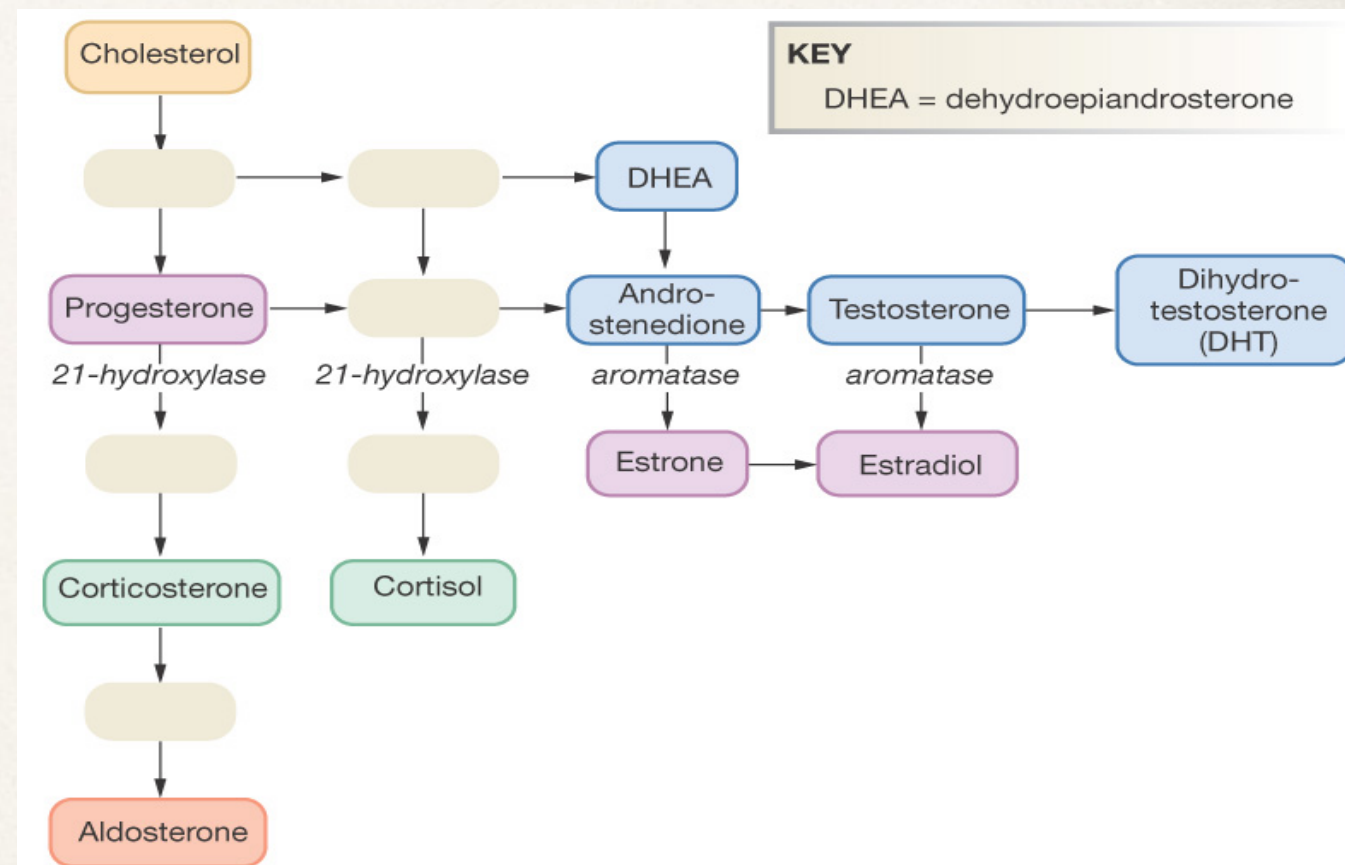
Histopathology

- ❖ Adrenal Cortex:
 - ❖ Zona Glomerulosa: Mineralocorticoids (Salt h.)
 - ❖ Zona Fasciculata: Glucocorticoids (Sugar h.)
 - ❖ Zona Reticularis: Androgens (Sex h.)
- ❖ Adrenal Medulla: Catecholamine (fight or flight)



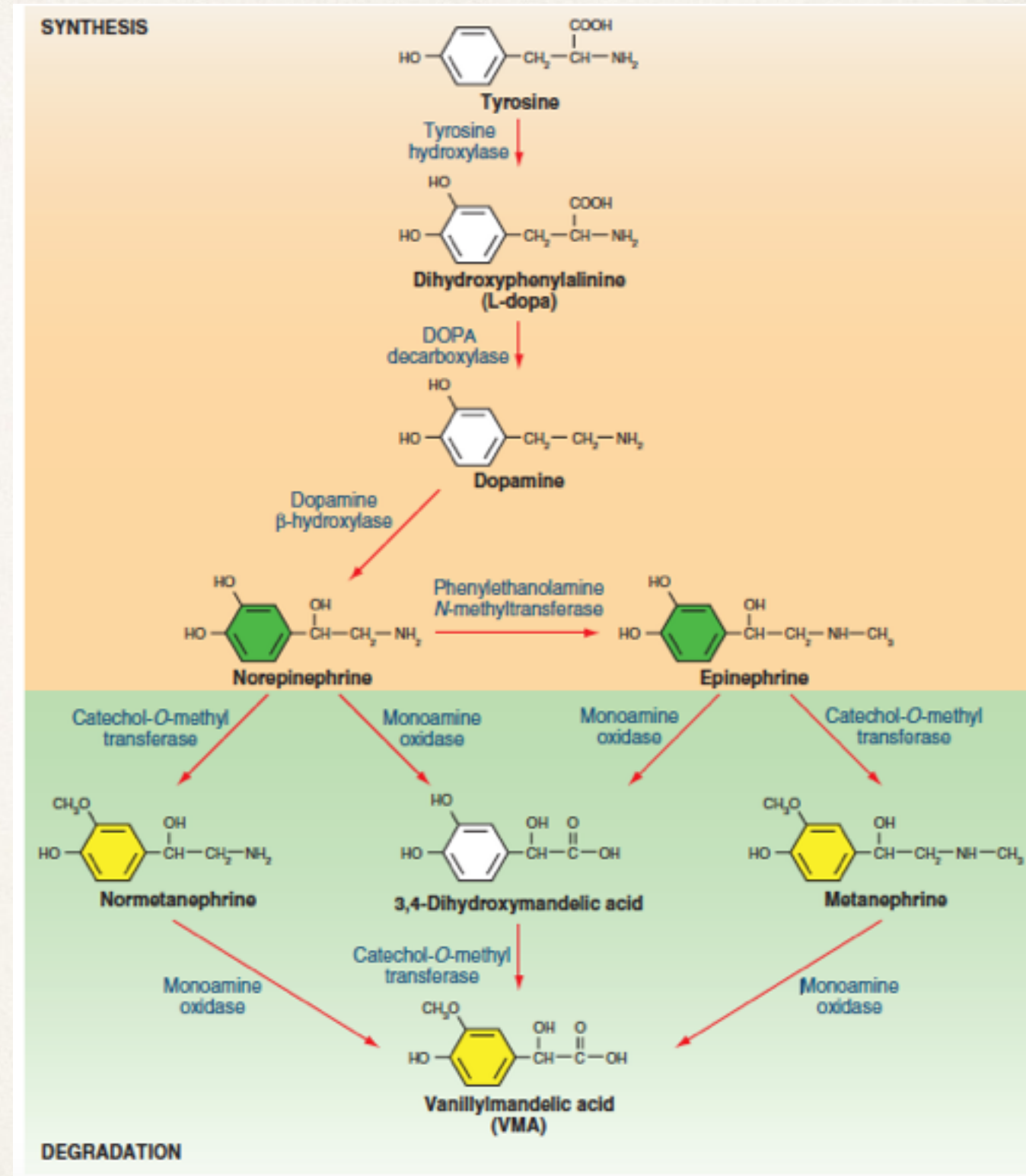
Adrenal Cortex

- ❖ Release of glucocorticoids controlled by ACTH (Anterior pituitary gland)
- ❖ Steroid Hormone Production:
 - ❖ Synthesized from cholesterol—steroid ring
 - ❖ Aldosterone, sex hormones, cortisol



Adrenal Medulla

- ❖ Sympathetic stimulation:
- ❖ Synthesized from the hydroxylation of Tyrosine
- ❖ Catecholamines:
 - ❖ Epinephrine
 - ❖ Norepinephrine



Diseases of the adrenal gland

Adrenal insufficiency

- ❖ Primary:

- ❖ Addison's disease:

- ❖ Autoimmune, Infection (TB / Histoplasmosis)

- ❖ Secondary:

- ❖ Suppression by prolonged steroid use, panhypopituitarism (Sheehan's syndrome)

Signs & symptoms

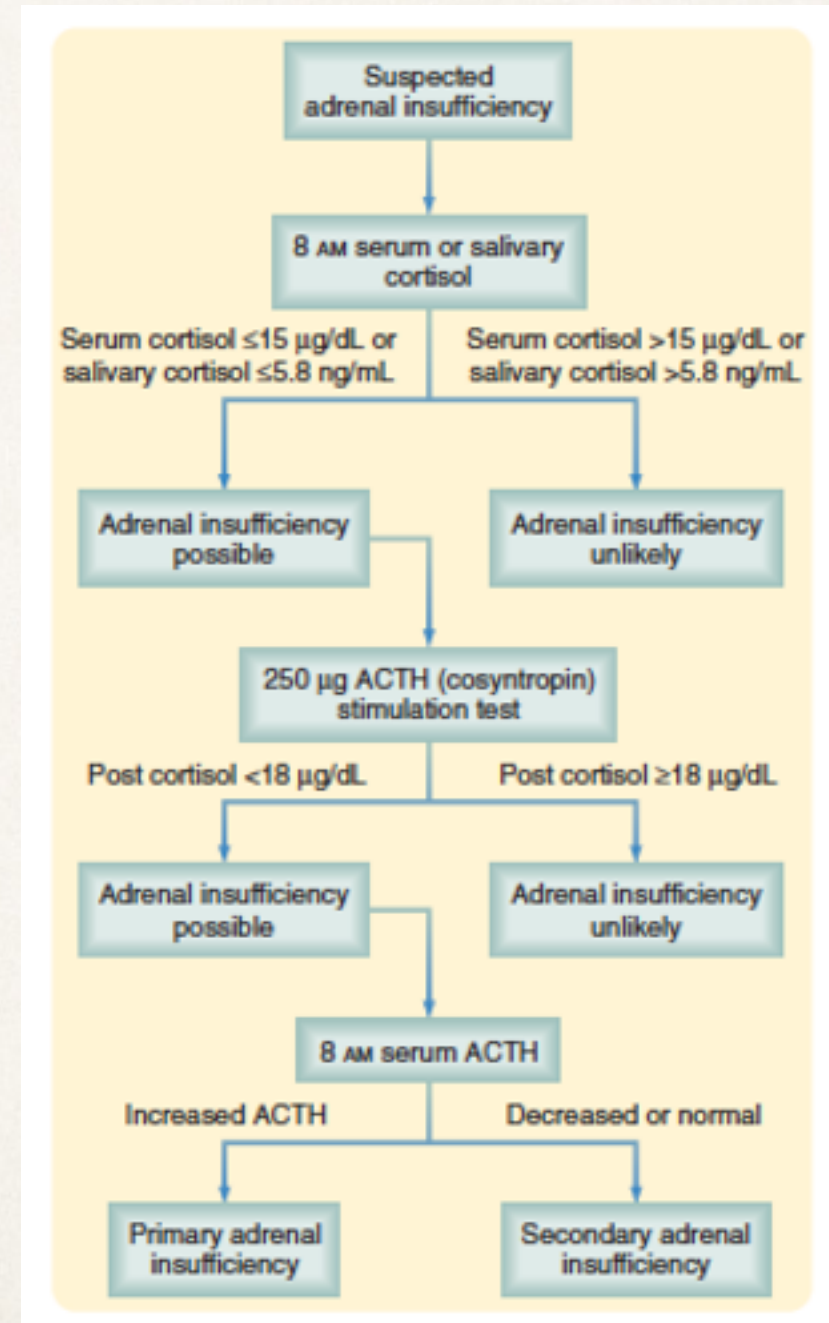
- ❖ Weakness and fatigue, anorexia, nausea or vomiting, weight loss, hyperpigmentation, hypotension, and electrolyte disturbances (hyponatremia and hyperkalemia).

❖ Addisonian Crisis:

- ❖ Dehydrated, pallor, weakness, N / V / D, confusion, headache
- ❖ Shock, tachypnic, tachycardic, hypoglycemic, Hypo Na, Hyper K, renal shut-down, coma, death

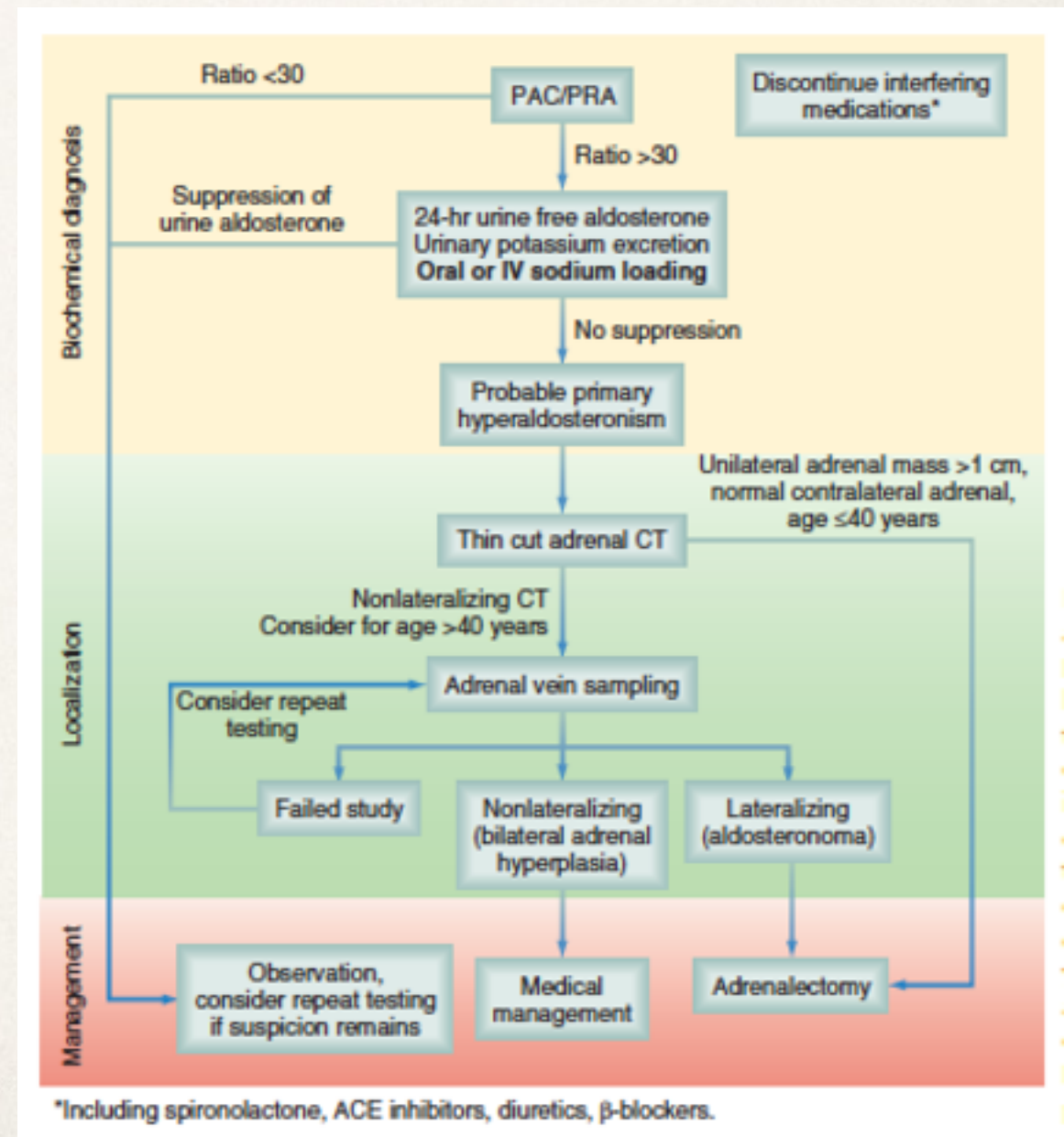
Diagnosis & treatment

- ❖ High index of suspicion, patients are usually trauma patients, ill in the ICU, steroid dependant in the **preoperative setting**.
- ❖ Diagnosis confirmed, then main stay treatment is replacement
- ❖ Treatment in Addisonian crisis:
 - ❖ Rapid infusion, 2L crystaloids
 - ❖ Monitored bed, ins & outs
 - ❖ ECG
 - ❖ IV solu-cortef Q6hr until s&s controlled



Diseases of the adrenal cortex

- ❖ **Primary hyperaldosteronism (Conn's disease):**
 - ❖ Resistant HTN, Hypo K
 - ❖ Etiology: Adenoma, bil-hyperplasia, carcinoma
 - ❖ Dx & Rx:
 - ❖ Ratio aldosterone ng/dl divided by renin ng/mlxhr



Diseases of the adrenal cortex

❖ Hyper cortisolism (Cushin'g Syndrome):

❖ Cortisol and body response to stress

❖ Permissive effect on glucagon

❖ Memory, learning and mood

❖ Gluconeogenesis

❖ Skeletal muscle breakdown

❖ Lipolysis, calcium balance

❖ Immune depression

❖ Circadian rhythms

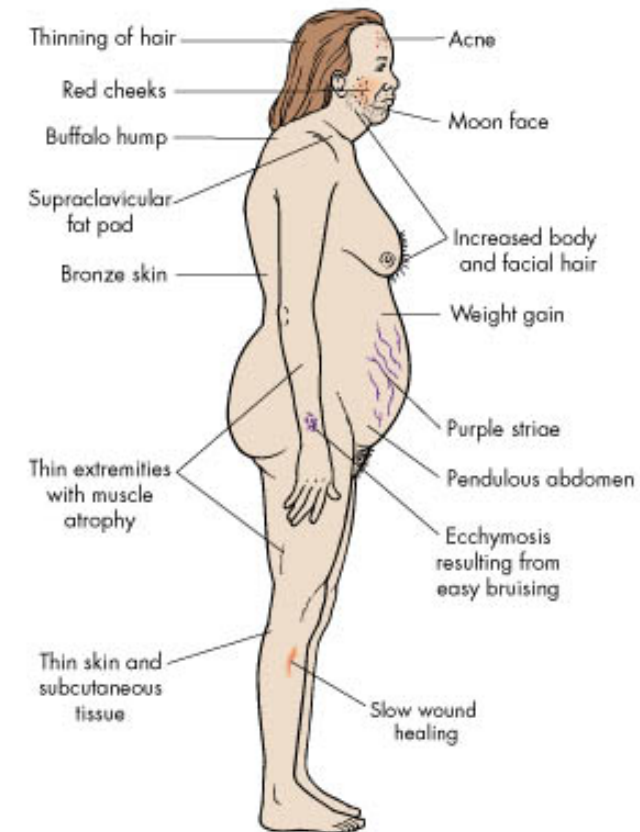
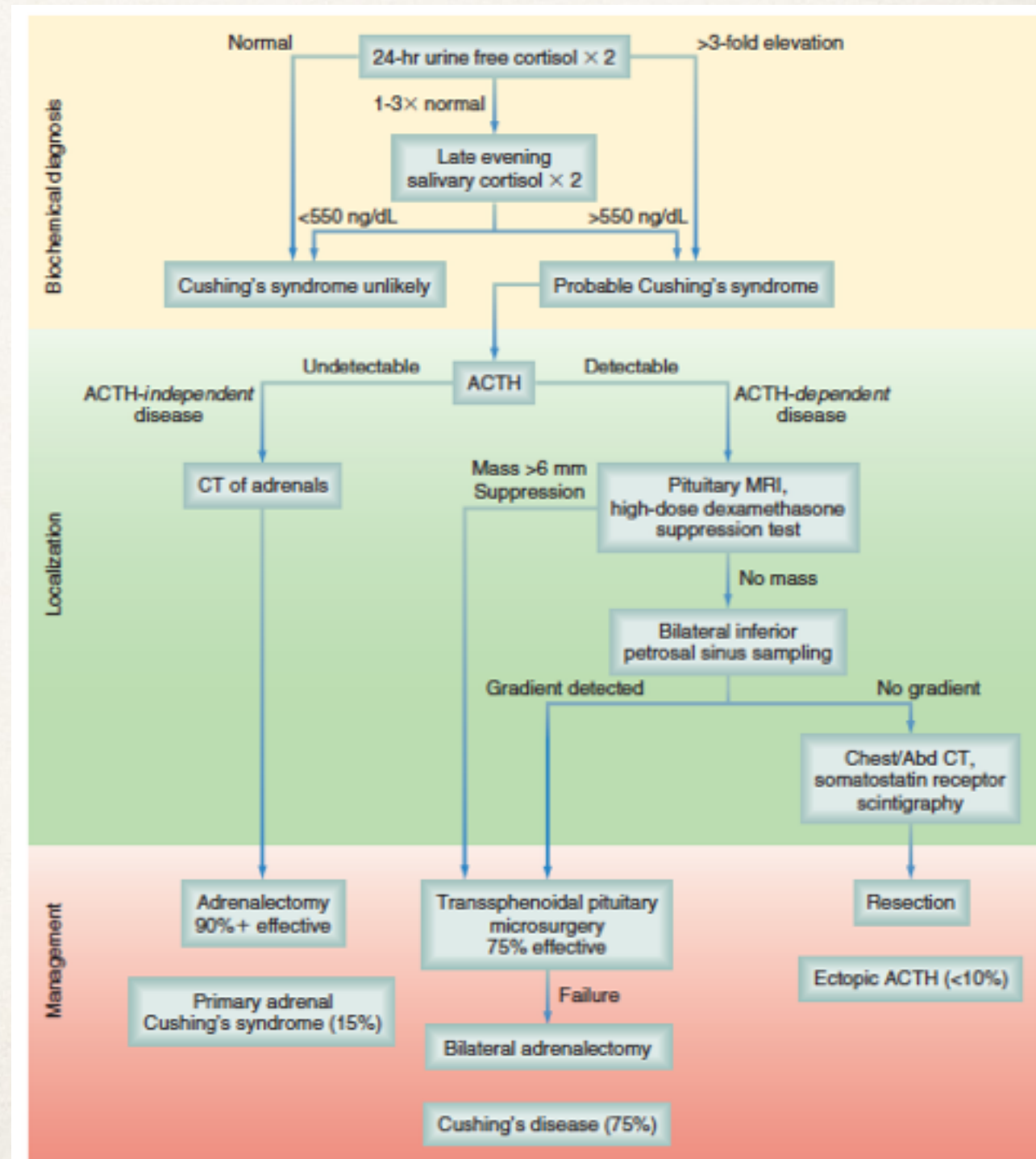


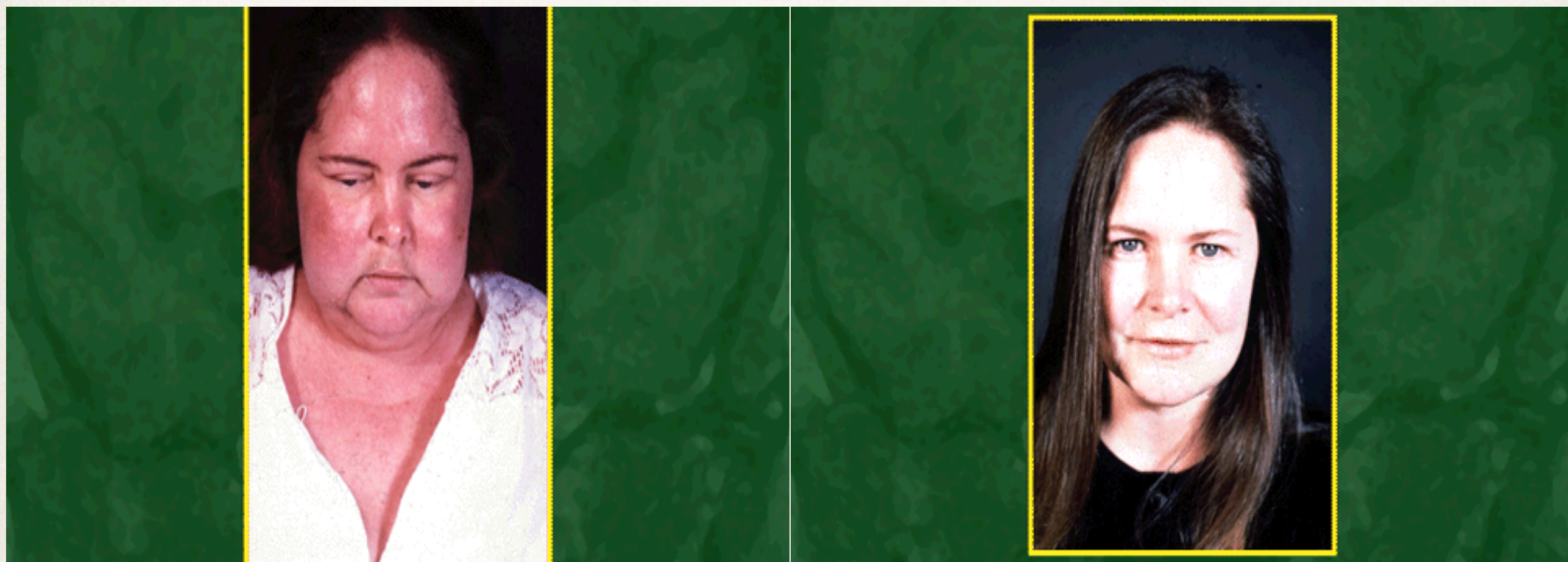
Figure 47-9 Common characteristics of Cushing's syndrome.

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Diagnosis & localization

- ❖ Primary adrenal Cushing's syndrome (ACTH-dependent)
- ❖ Pituitary corticotroph microadenoma
- ❖ Cushing's disease (ACTH-independent)
- ❖ Adenoma, Cortical carcinoma, bil. hyperplasia

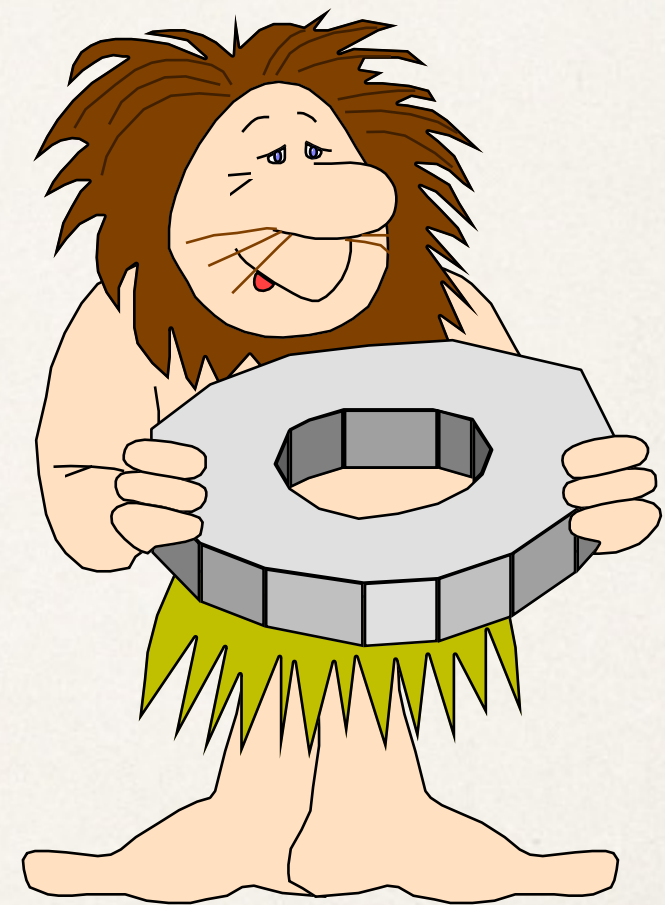




Diseases of the adrenal cortex

❖ Androgen (Sex steroid excess):

- ❖ Rare, virilizing, associated with advanced adrenal malignancy (1 / 4 display Cushing's syndrome features)
- ❖ Almost all feminizing tumors are malignant, and 1 / 3 of virilizing tumors.



Adrenocortical Carcinoma

- ❖ 1 / million
- ❖ Middle aged, peds <5 yr
- ❖ Large when discovered
- ❖ 5 yr survival rate 15-20%
- ❖ > 50% are functional
- ❖ CT scan
- ❖ Surgical resection

Diseases of the adrenal medulla

- ❖ **Pheochromocytoma:**

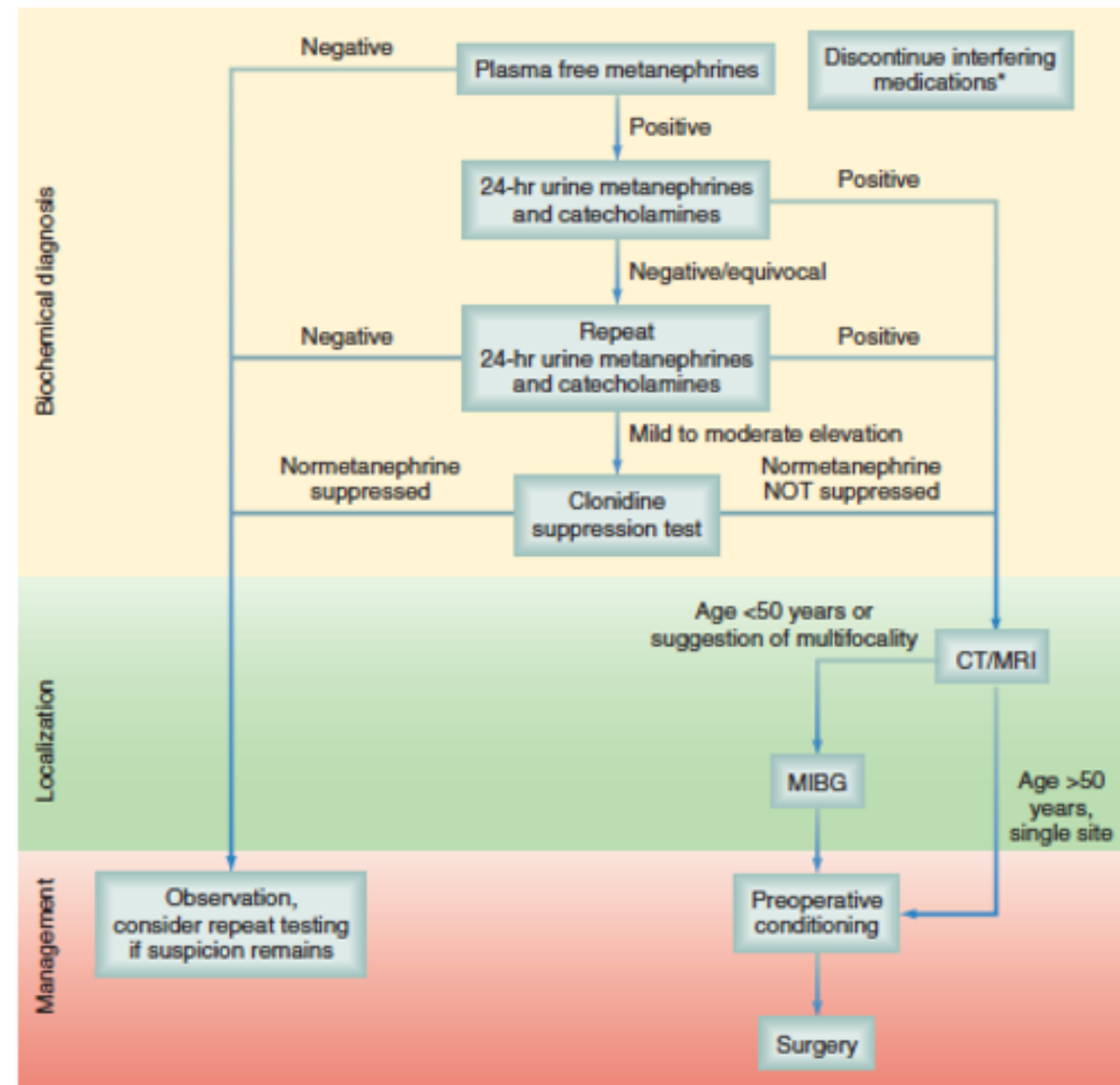
- ❖ 0.2% of hypertensives

- ❖ Triad: H / A, diaphoresis, and palpitations

- ❖ 10%: Bil, malignant, extra-adrenal, familial

Diagnosis & localization

- ❖ Dx: 24hr urine-VMA, plasma catecholamines, CT, MIBG
- ❖ Preop intervention:
 - ❖ Adrenergic blocker
 - ❖ Beta blockers
 - ❖ Sedatives/ antidepressants
- ❖ Intra op:
 - ❖ Art-line to monitor BP
 - ❖ Potent BP lowering agents, and BP elevating agents



*Including sympathomimetics, phenoxybenzamine, acetaminophen, many psychotropic drugs.

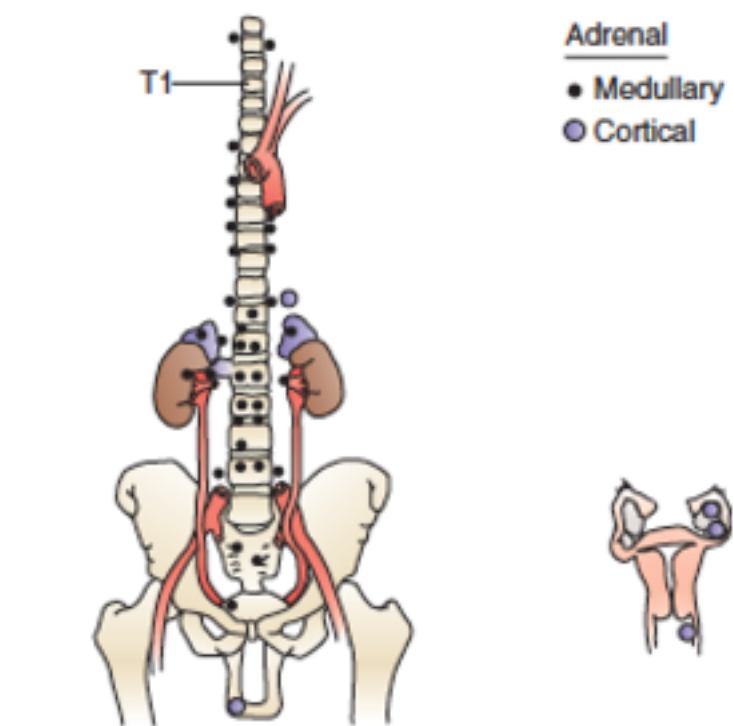
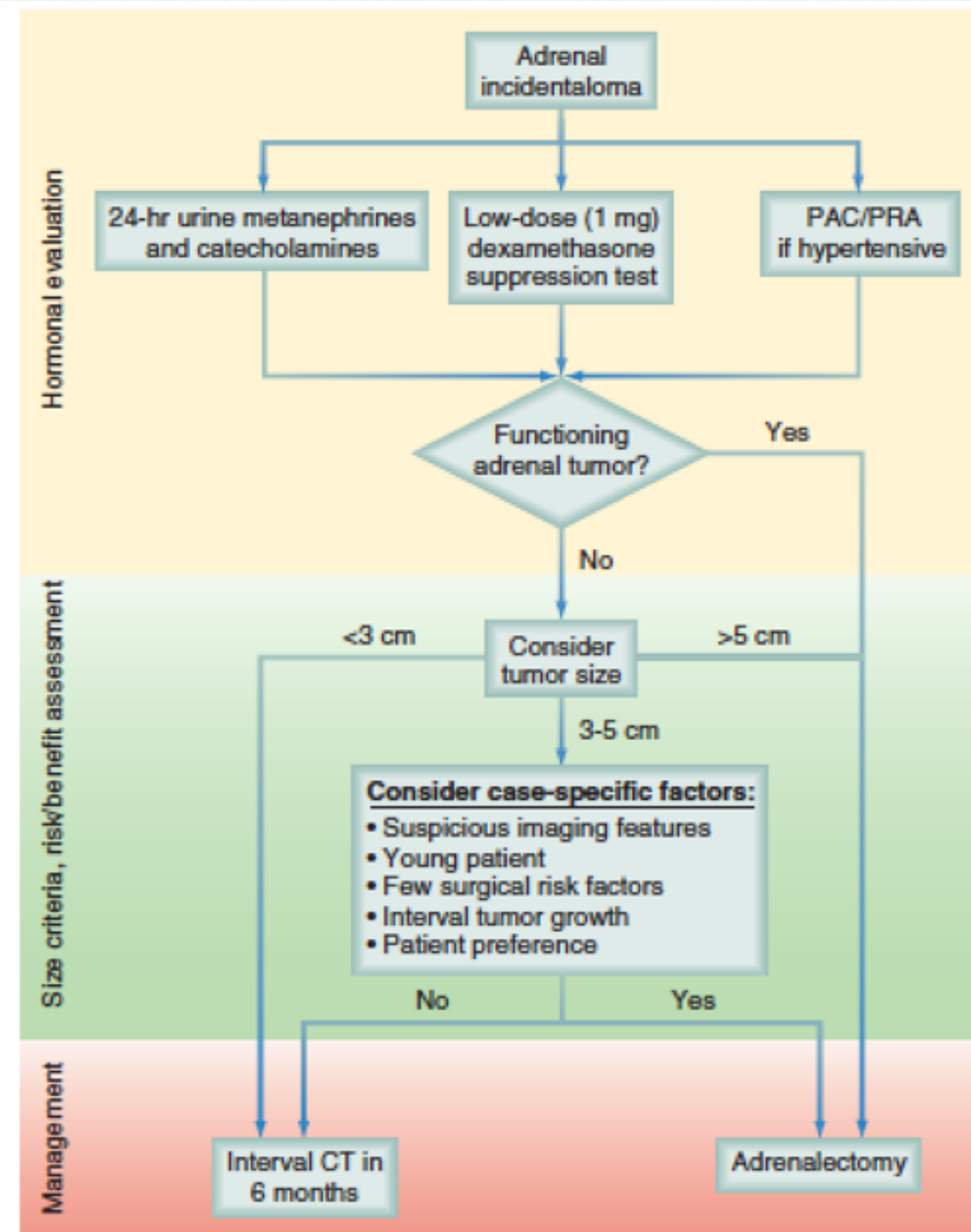
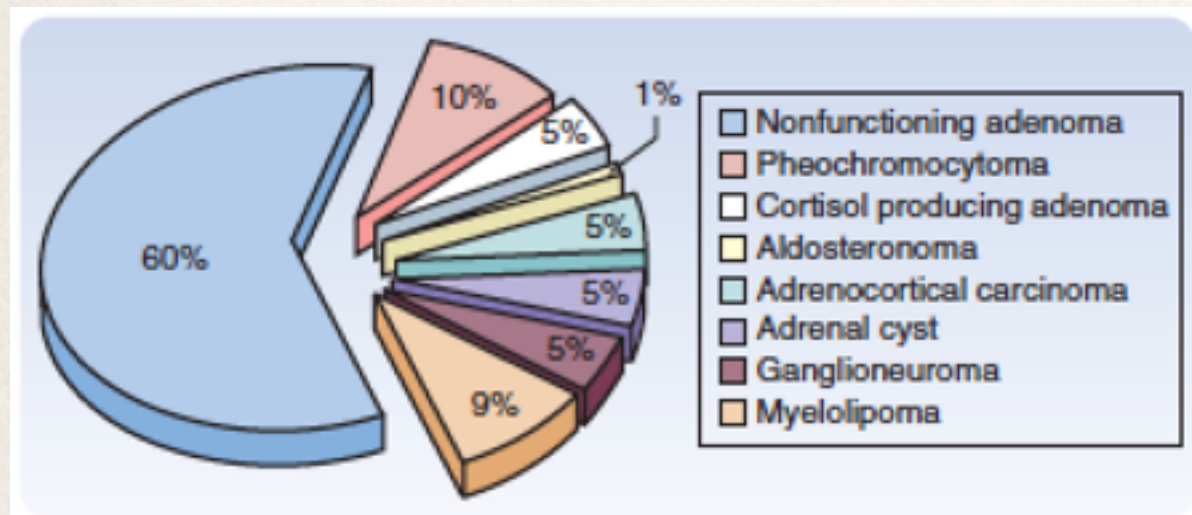


FIGURE 41-2 Sites of extra-adrenal cortical and medullary tissue.



Incidenteloma

- ❖ 4%
- ❖ Detailed Hx
- ❖ Labs
- ❖ CT / MRI



- ❖ Keep high index of suspicion
- ❖ Is it functional or not?
- ❖ Is it malignant or not?
- ❖ Take precautions in the preoperative period